

Try

①  $\int x^3 \ln x \, dx$

②  $\int x^3 \sin x \, dx$

③  $\int e^x \cos x \, dx$

③  $\int e^x \cos x \, dx$     $u = e^x$     $du = e^x$     $dv = \cos x$     $v = \sin x$

$= e^x \sin x - \int \sin x e^x \, dx$     $u = e^x$     $du = e^x$     $dv = \sin x$     $v = -\cos x$

$\int e^x \cos x \, dx = e^x \sin x + e^x \cos x - \int e^x \cos x \, dx$

$+ \int e^x \cos x \, dx$

$$\boxed{\int e^x \cos x \, dx = \frac{e^x \sin x + e^x \cos x}{2} + C}$$

$$\begin{aligned}
 1. \quad \int x^3 \ln x \, dx & \quad u = \ln x \quad du = \frac{1}{x} \quad dv = x^3 \quad v = \frac{x^4}{4} \\
 &= \frac{x^4 \ln x}{4} - \frac{1}{4} \int x^3 \cdot \frac{1}{x} \, dx = \boxed{\frac{x^4 \ln x}{4} - \frac{x^4}{16} + C}
 \end{aligned}$$

$$\int x^3 \sin x \, dx$$

$u$		$dv$
$x^3$	$+$	$\sin x$
$3x^2$	$-$	$-\cos x$
$6x$	$+$	$-\sin x$
$6$	$+$	$\cos x$
	$-$	$\sin x$

$$= -x^3 \cos x + 3x^2 \sin x + 6x \cos x - 6 \sin x + C$$

$$uv = \int v \, du \, dx$$

$$(uv = \int v \, du \, dx)$$

$$uv = \int v \, du \, dx$$

$$\textcircled{1} \int x^2 e^x dx$$

$$\textcircled{2} \int 2t^2 \cos(3t) dx$$

$$1. \int x^2 e^x dx$$

u	dv
$x^2$	$e^x$
$2x$	$e^x$
$2$	$e^x$
$0$	$e^x$

$$\int x^2 e^x dx =$$

$$x^2 e^x - 2x e^x + 2e^x + C$$

$$2. \int 2t^2 \cos(3t) dt$$

u	dv
$2t^2$	$\cos(3t)$
$4t$	$\frac{1}{3} \sin(3t)$
$4$	$-\frac{1}{9} \cos(3t)$
$0$	$-\frac{1}{27} \sin(3t)$

$$\frac{2}{3} t^3 \sin(3t) + \frac{4}{9} t \cos(3t) - \frac{4}{27} \sin(3t) + C$$

$$\int \ln x \, dx \quad u = \ln x \quad du = \frac{1}{x} \quad dv = dx \quad v = x$$

$$\ln x \cdot x - \int x \cdot \frac{1}{x} \, dx$$

$$\boxed{x \ln x - x + C}$$

$$\int \sin^{-1} x \, dx \quad u = \sin^{-1} x \quad du = \frac{1}{\sqrt{1-x^2}} \quad dv = dx \quad v = x$$

$$x \sin^{-1} x - \int x \cdot \frac{1}{\sqrt{1-x^2}} \, dx$$

$$\begin{aligned} u &= 1+x^2 \\ du &= 2x \, dx \\ \frac{1}{2} du &= x \, dx \end{aligned}$$

$$x \sin^{-1} x - \frac{1}{2} \int \frac{1}{\sqrt{u}} \, du \quad \int u^{-\frac{1}{2}} \rightarrow 2 u^{\frac{1}{2}}$$

$$\boxed{x \sin^{-1} x - \sqrt{1-x^2} + C}$$

6.3

#17-20(3), 21-24(3), 25-27(3)